

Ontario Department of Agriculture

FRUIT BRANCH

THE PEAR IN ONTARIO

F. M. CLEMENT* AND O. J. ROBB.

The pear has always been a more or less favorite fruit with both grower and consumer. The demand for many years has been scarcely equal to and at no time greater than the supply; consequently, but for the ravages of Pear Blight, it is reasonable to expect that plantings would have increased rapidly. The many large trees found growing to-day in various parts of Ontario, on which have been grafted three, four and five varieties, and in many cases twenty varieties and more, bear silent testimony to the esteem in which this fruit was held in past years and by the pioneer.

The object in writing these few pages is to make a summary of the industry from a study of the general situation with the hope of stimulating to some extent a somewhat neglected industry and to rouse those interested to fight still more faithfully the Blight, the dread disease that is holding the possibility of rapid development of the industry in check.

THE INDUSTRY.

The 1901 Census of Canada credits the Dominion with 617,293 bearing trees and 344,808 non-bearing trees. The 1911 Census of Canada credits the Dominion with 581,704 trees bearing and 385,538 trees non-bearing, a decrease of 35,589 bearing trees and an increase of 40,730 non-bearing trees; making an increase of 5,141 trees, bearing and non-bearing, in the Dominion.

The 1901 Census credits Ontario with 564,798 bearing trees. The 1911 Census credits Ontario with 505,368 bearing trees, a decrease of 59,430 trees in ten years.

The 1901 Census credits Ontario with 280,175 non-bearing trees and the 1911 Census credits Ontario with 237,769 non-bearing trees, a decrease of 42,406 trees in ten years.

In other words, the total decrease for Ontario in ten years is 101,836.

*At the time this Bulletin was written Mr. Clement was the Director of the Horticultural Experiment Station, Vineland.

Production figures for these years are not available for this fruit; nor are import figures for pears alone. Under the particular head of fresh fruit entered for consumption in Canada are also listed, quinces, apricots and nectarines. Pears however, make up by far the greater bulk of the total imports under this head.



Fig. 1. Dwarf Duchess tree in bloom. Age, 10 yrs.

The imports into Ontario of these fruits during the last three years were as follows:

	Lbs.	Value.
1913	3,475,974	\$86,497
1914	1,789,707	76,649
1915	2,338,282	71,987

The imports of these fruits into Canada for a part of the same period and the last fiscal year were as follows:

	Lbs.	Value.
1914	11,040,871	\$446,932
1915	11,780,751	384,160
1916	11,625,576	271,991

Certainly some part of these fruits is imported at a time when home grown fruits are not on the market, but nevertheless a large part of them comes into direct competition with the home grown product.

A careful study of the industry seems to indicate that pear growing is now and is likely to be for some time a profitable industry. Why production has scarcely equalled the increased demand is very likely to be found largely, if not entirely, due to the ravages of Fire Blight (*Bacillus amylovorus*). Young, thrifty trees suffer more than older, slower growing trees, and it is undoubtedly for this reason that the total number of trees in the Province does not show an increase.

PEAR CLASSES.

Two distinct classes of pears are grown in Ontario. In the one, we have the common European varieties so generally popular: Bartlett, Flemish Beauty, Bosc, Anjou and many others. In the other class we have the less popular but still quite heavily planted varieties such as the Kieffer, Garber and Le Conte. The



Fig. 2. Three pear types. Bartlett, Hybrid-Kieffer and Chinese Sand. The Kieffer is a cross between the other two types.

former of these three varieties is, in some sections of the east, very heavily planted. These latter varieties are hybrids between the European pear (*Pyrus communis*) and Chinese Sand Pear (*Pyrus serotina*) (formerly, and as it now appears erroneously identified as *Pyrus sinensis*). Generally speaking, they lack the quality of the European varieties but may possibly be a little less subject to Blight. This statement, however, does not hold true in every instance.

The pear is also one of the favorite fruits and is grown as a garden tree wherever climate and soil will permit. Fond remembrances are retained of fine

old trees in the dooryards of the older homesteads, many of which are still bearing good crops in spite of neglect. Naturally the tree is very hardy and exceedingly long-lived. Historically, it is one of the oldest fruits, having been grown in Europe for over three centuries. It is believed that the original trees came from Southern Persia, but it is due to the improvement work of the last two centuries in Europe that we have so many excellent varieties at the present time.

Several good varieties have been originated in the United States and a few have been originated in Canada. It may be interesting also to know that of the many hundreds of named and described varieties known to-day, by far the greater number belong to England, France, Belgium and Germany. Possibly more work has been done on improvement and propagation in Belgium than in any other country.

In the experimental orchard at Vineland upwards of one hundred and fifty varieties including all the common ones and many French and other European varieties are under test.



Fig. 3. Dwarf Duchess orchard. This orchard is clean cultivated.

The pear has nearly as wide a range of culture in the Province as the apple. It is grown to some extent at Ottawa and all along the upper St. Lawrence River, and it succeeds as far north as Manitoulin Island, but is not found inland or on the higher lands which are not nearly as far north as Manitoulin Island. In these northern sections it is limited to one or two of the hardest varieties. Possibly the range of commercial culture might be said to follow the line of commercial apple culture with a slightly shorter range extending along the upper St. Lawrence and Lake Ontario and west to Georgian Bay, including a small section south of Lake Simcoe, also in many sections within these limits only the most favorable sites should be chosen.

Of the dozen or more common varieties grown in the Province the following are recommended for the respective districts:

VARIETIES RECOMMENDED.*

General list, approved by the Board of Control.

Giffard, Clapp, Bartlett, Boussock, Flemish (hardy, subject to spot), Howell, Louise, Duchess, Bosc, Clairgeau, Anjou, Kieffer.

DISTRICT LISTS.

Niagara District.

(Including the Niagara Peninsula from the Niagara River to Hamilton and north of the escarpment.)

The late Robert Thompson, St. Catharines: Giffard, Clapp, Bartlett, Bosc, Duchess (dwarf), Anjou, Kieffer.

Egbert M. Smith: Giffard, Bartlett, Howell, Louise, Flemish, Duchess (dwarf), Anjou, Kieffer.

Burlington-Oakville District.

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto.)

A. W. Peart, Burlington: Wilder, Clapp, Bartlett, Boussock, Louise, Duchess (dwarf), Anjou, Kieffer, Lawrence, Nelis.

W. F. W. Fisher, Burlington: Lawson, Clapp, Bartlett, Duchess, Anjou, Nelis.

Essex Peninsula.

(Including Essex, Kent and Pelee Island.)

J. L. Hilborn, Leamington: Bartlett, Anjou, Duchess.

J. Atkins & Son, Leamington: Bartlett, Kieffer, Duchess.

Lake Huron District.

(Including Counties of Huron and Bruce.)

D. F. Hamlink, Goderich: Clapp, Bartlett, Louise, Clairgeau, Anjou.

Georgian Bay District.

(Including northern portions of the Counties of Grey and Simcoe bordering on the Georgian Bay.)

J. G. Mitchell, Clarksburg: Clapp, Bartlett, Flemish, Duchess, Anjou, Clairgeau.

Lake Simcoe District.

(Including the northern and eastern section of Simcoe and northern sections of York and Ontario, bordering on Lake Simcoe.)

G. C. Caston, Craighurst: Clapp and Bartlett.

* Fruits of Ontario.

Guelp District.

(Including the high inland counties of south-western Ontario, i.e., Wellington, Waterloo, north-western section of Perth, south part of Grey, Dufferin, and north-west section of Peel and Halton.)

Prof. J. W. Crow, O.A.C., Guelp: Clapp, Flemish, Seckel, Sheldon, Anjou.

Lake Ontario District.

(Including the southern portions of the counties bordering on the Lake Ontario shore from Toronto to Trenton.)

W. H. Dempsey, Trenton: Giffard, Clapp, Boussock, Hardy, Bosc, Clairgeau, Lawrence.

St. Lawrence Valley District.

(Including the Valley of the St. Lawrence from Kingston to the eastern boundary of the Province.)

Harold Jones, Maitland: Flemish (if grown in sod), Ritson (not so hardy in fruit bud as Flemish).

Ottawa District.

(Including the Ottawa Valley and the eastern portion of the Province, not elsewhere enumerated, south of latitude 46 degrees.)

W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa: Flemish in most favored parts.

VARIETIES.

A number of the more important leading and promising varieties are described in the following pages. This list is intended as a guide to the grower in selecting varieties to suit his conditions. An ideal commercial orchard will contain not more than six of these varieties and possibly as few as two. The varieties are arranged alphabetically.

Anjou (Beurre d'Anjou) is one of the more widely grown varieties, although it is claimed by some to be a shy bearer. Under proper conditions this variety bears large crops every year. It succeeds well on *C. . .* stock. The fruit is medium to large in size, greenish-yellow color with a brownish-red blush on the side; ripens in December and is a valuable pear for shipping to distant markets. The variety is losing somewhat in favor although the tree is very hardy and not as subject to blight as most varieties. It is in good demand.

Bartlett (Williams) is too well known to require any description. Take away the Bartlett, and the pear crop will be reduced nearly two-thirds. There is no one variety of fruit so well known and so universally grown as this variety. It is unexcelled in size and quality, and has won a well merited reputation all its own. It is in great demand. The fruit is ready to pick late in August or early in Septem-



Fig. 4. Dwarf Bartlett tree showing fruit. Age 6 yrs.

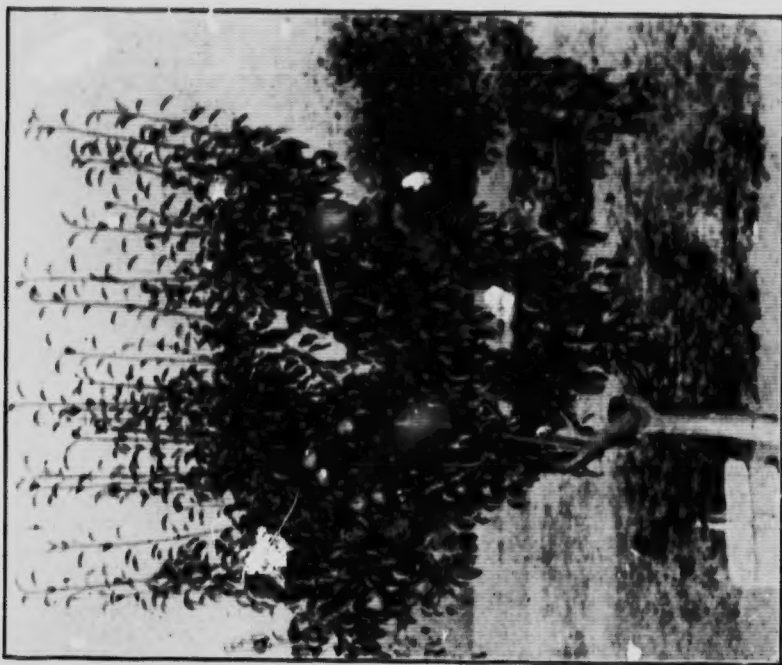


Fig. 5. Dwarf Flemish Beauty. Age 6 yrs.

ber in Southern Ontario. When well grown the fruit is large, greenish-yellow, with a reddish tinge on one side. The tree does well on either standard or dwarf stock, being much longer lived on the standard. It requires to be cross pollinated to secure a full set of fruit. At times the tree is badly attacked by blight, but on the whole with reasonable attention it will survive. This variety should be grown more extensively as there is a ready and unlimited market for Bartletts of quality.

Boussock (Doyenne Boussock) is a hardy and fairly productive tree, but slow in bearing and of only second rate quality when compared to the Bartlett. The fruit which is apt to drop before fully mature ripens by the end of September.

Bosc (Bosc's Beurre): This is an excellent pear for the late fall market, and is grown more extensively as it becomes better known. It is a slow bearer, but the fruit when once produced is of the finest quality. The fruit is large, greenish-yellow, covered with russet and will stand shipment very well. The tree thrives over Southern Ontario and does best on standard stock. It requires to be double worked if grown on dwarf stock. The tree is very subject to blight, and consequently can be grown only with the most intelligent care.

Clapp's Favorite is widely grown and much favored both as an early home market and distant shipment variety. It matures just ahead of the Bartlett. The fruit is of first-class quality if picked well before it shows signs of softening on the tree. It soon passes out of season, as it will not stand storage long, quickly showing signs of decay at the core. The fruit when well grown is large and brightly colored on one cheek. The tree is a vigorous grower and a heavy bearer, but is very subject to blight; in fact, many orchards have been lost, and the present supply of this excellent variety is limited. Where the blight does not trouble the tree it is one of the most profitable varieties commercially grown. This pear is of American origin, succeeds best on standard stocks and is quite hardy in all the fruit districts.

Clairgeau is a desirable pear for shipping to local and distant markets owing to its size and fine appearance. It ripens late in October giving large yields of excellent fruit. The tree bears early on either standard or dwarf stock succeeding best on the standard. This makes a valuable variety to follow the Bartlett on the market. It is very hardy and should be planted more extensively as it has a wide range of adaptability.

Duchess (Angouleme) is a well known variety that has been largely planted on dwarf stock. The one serious failing of this fruit is that the tree is a shy bearer, very often failing to set full loads of fruit even when the tree is covered with bloom. It should be planted only in the sections where it has already proven a success. The fruit is inclined to be large and rough but is very high in quality and will ship anywhere with good success. The pear would be a general favorite among the growers if a good yield could be depended on each year. Even with many off years it holds a very high place in the esteem of those who know it best.

Easter Beurre: This is another good winter variety, being vigorous and very productive where grown on good, rich, favorable soil. It does best on the dwarf stock in Ontario. The fruit is large and inclined to be rough, and is green in color at picking time (late October). It is an excellent variety for export purposes and is recommended for further planting.

Flemish Beauty: This is one of the oldest and most widely distributed and best known varieties. It is without doubt the hardiest of the well-known varieties, being successfully grown in the more northern fruit districts. The variety is a general favorite owing to its productiveness and early bearing character, but in the more southern sections it is much affected by scab; in fact, it is very difficult to

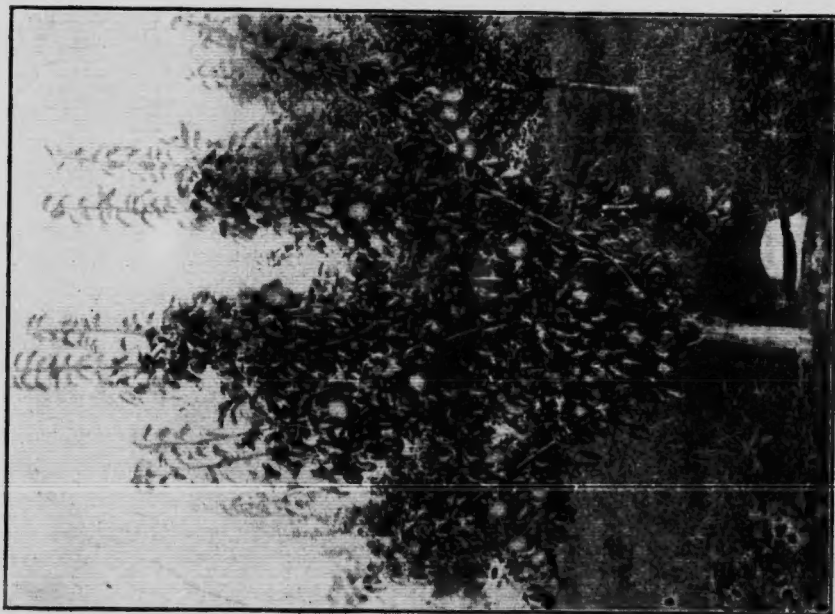


Fig. 6. Dwarf Duchess tree showing fruit. Age, 6 yrs.



Fig. 7. Standard Kieffer tree.
Age, 6 yrs.



Fig. 8. Young pear tree stripped
of leaves before planting
in fall.

produce a crop of clean fruit. The fruit is of the highest quality, ripening in late September. Although grown extensively in many sections it is not now considered a profitable variety in most of the commercial fruit districts, because of its susceptibility to scab.

Giffard: This variety is to be recommended as an early market pear. With good cultivation on rich soil it attains a good average size and usually commands the highest price, because of its quality as a dessert and cooking pear at that particular season. The fruit ripens by the end of July and is medium in size, light green in color with a faint blush. The tree succeeds best on standard stock, making a straggling growth, but is hardy and a very productive annual bearer. The blossoms are self-fertile and the tree is not subject to bad attacks of blight. This variety could be planted more heavily.

Howell: This is another valuable variety originating in America at New Haven, Conn. It is a very desirable commercial variety being productive and vigorous, bearing full crops of large sized, good quality fruit.

This variety is recommended for the southern parts of Ontario and is worthy of further planting. It succeeds best on standard stock.

Kieffer: This has been one of the most profitable varieties owing to its great productiveness. Good crops are produced almost every season and the fruit will stand shipping any distance. This variety succeeds over a wide area but does best in the more favored sections when grown on good, rich soil. It often suffers from attacks of blight. In recent years it has lost much in popularity due to its poor quality.

The Kieffer is a hybrid, being a seedling from a natural cross of the Bartlett and the Chinese Sand Pear (*Pyrus serotina*). The latter is a native of Asia, being hardy, productive and almost wholly blight resistant, but the quality of the fruit is very poor.

The poor flavor and coarse texture of the Kieffer are characters of its Asiatic parent. This variety should only be planted for shipping to distant markets, or for canning purposes when in demand.

Lawrence is a very desirable pear for early winter. It has many characters to recommend it. The tree is hardy and produces good crops of medium sized fruit of high quality. The fruit ripening in December comes at a time when other varieties are scarce. It should not be overplanted as the market is limited.

Lawson: This is an early pear of rather poor quality, ripening in August. The fruit is handsome in appearance, but is of little value except for the home markets, and is, generally speaking, not a profitable variety to grow. The tree is fairly vigorous and succeeds best on quince stock. It is grown only in the southern parts of the Province.

Ritson is a very valuable variety which originated in Ontario near Oshawa. The tree is a regular bearer of good crops of medium sized fruit, which is of first-class quality. It is valuable for both canning and home markets. This variety succeeds over a wide area and is very profitable where properly handled.

Seckel is without doubt the highest quality pear grown in the Province. It succeeds best on quince stock and is very hardy and productive. This is a very profitable variety where it is known on the market, but its small size is against it where its fine quality has not already been recognized. It is not recommended for commercial planting unless it is intended to supply a special market.

Sheldon: This high quality, dessert pear is not grown very extensively owing to its shy bearing habit and to the tenderness of the fruit. It is valuable only for

the home market in October and is not a profitable variety to grow. It falls very easily.

Tyson: This is a medium sized variety, of good quality, but is valuable only for the home market as it comes in too near the Bartlett season to be profitable. It is a valuable addition to any garden collection, and is of American origin. It is not widely grown in this Province.

Wilder: This variety ripens in August, and though early is not widely grown. It is excelled in productiveness by the Tyson which comes at the same season. The fruit is medium to large with a deep red cheek and of first-class quality. It is valuable for the home market. The tree is a very productive and early bearer on dwarf stock. This variety might be planted more extensively.

Winter Nelis (Beurre Thoun): This is an old favorite as a late winter variety. The fruit is rather small but has proven to be a somewhat profitable variety. The tree is hardy and very productive, succeeding best where top-worked on some other variety, such as Duchess or Bartlett.

Bartlett Seckel (Barseck): This is a new variety of high quality. It is larger than the Seckel and of better quality than the Bartlett. It is a cross between the Bartlett and Seckel originated by Mr. Moore, at Rochester, N.Y. The variety is to be recommended for special markets only.

SOILS.

Because the pear is very often found growing in dooryards, along fences, roadsides and various other out of the way places, is no indication that it has no soil preference. The fact that it grows everywhere indicates rather that it is fairly well adapted to a wide range of soils and can more or less adapt itself to varied conditions.

Though the tree is not as quickly or immediately weakened and destroyed by excess water as the peach and the cherry, the destruction due to excess is none the less sure. The tree cannot long survive an excess of moisture.

The soil may range from a sand to a clay, with a decided preference for loams and clay loams. The deep, strong, heavier lands seem to fill the requirements best especially if well underdrained. On the lighter soils, the trees possibly respond to cultivation and manure a little quicker than on the heavier soils, but the stimulated growth is also more subject to the dreaded blight. The heavier soils maintain the steadier growth and because of this are to be preferred.

The subsoil must be deep and open. No tree can possibly be a profitable bearer and long-lived that is forced to feed on the surface only. Many good pear orchards are on stoney and gravelly soils. These soils, though difficult to cultivate, are often deep, rich and open and are consequently ideal for growth and production. Though adapted to heavier and rougher soils than the peach and the cherry, it must not be inferred that the tree will thrive on any soil that is not adapted to these fruits. Choose the site as carefully as for a tender fruit.

If possible, choose sloping ground preferably to the north or east. This insures good drainage and circulation of air. Rolling land with no deep hollows or pockets is the ideal site for a pear orchard. Our best orchards are on sloping lands which drain early and never are wet and sour. While many of the largest orchards are in close proximity to the large lakes the pear succeeds equally well far inland in the southern part of the Province and is very hardy and long-lived. Many trees in these situations in the different parts of the Province are known to be upwards of one hundred years old.

DWARF PEARS.

As stated elsewhere standard pears are grown on seedling, largely imported, pear roots. A few for purposes of dwarfing are grown on quince roots.

It is claimed for the dwarf trees that they come into bearing more quickly, that more trees can be grown to the acre, that the trees are more blight resistant than standard trees and that the quality of the fruit is higher. Undoubtedly the trees are smaller, and more trees can be grown to the acre, but the first cost of the trees (not individually) per acre is higher, the number of baskets produced per acre is no greater than for standard trees, and cultivation is possibly a little more difficult on account of the close planting. It is admitted, however, that the trees are more resistant to blight. The most common variety grown on dwarf stock is Duchess of Angouleme. Other varieties: Bartlett, Anjou, Flemish Beauty are also grown on quince stock, but it is not proven that anything is gained except possibly greater blight resistance and earlier bearing. No experimental data is available on which to base definite conclusions regarding yield and quality. Dwarf trees planted too deeply will send out roots from the trunk underground but above the quince root. Such trees will quickly establish themselves on their own roots and grow much larger than the dwarfs around them.

PLANTING.

The time to plant depends largely on the condition of the soil, but also on availability of the proper grade of *well ripened stock*. Experiments seem to indicate that fall planting will result in as large a percentage of "takes" as spring planting, or possibly a little larger if well ripened trees are obtainable in early October and planted at once. Well ripened trees are not always obtainable at this time, though they are more likely to be obtainable than the Baldwin or especially the Northern Spy apple. If the stock is well grown, and the leaves have dropped early, because of early ripening of the wood, good results can be expected from fall planting.

The distance apart to plant may vary a great deal depending on the desires of the grower and methods of cultivation and pruning practised. The average distance is 20 ft. x 20 ft. Many orchards are set 18 ft. x 20 ft., some 18 ft. x 18 ft. and various other distances. The recommended distance for standard trees is 16 ft. x 20 ft.

Trees from the nursery usually have well branched tops. Prune these as little as possible; cut back little or not at all. If enough good branches—two to four—are available, use these for the framework of the tree. If these are cut back or removed equally good ones do not always replace them. Severe cutting back induces rapid growth with the consequent susceptibility to blight.

CULTIVATION AND FERTILIZATION.

The extent to which a pear tree may be cultivated and manured is determined largely by the prevalence of blight or the degree to which the variety is subject to blight.

The pear, like the peach and the cherry, quickly responds to clean, thorough cultivation, and where such a practice may be followed the fruit is invariably the

cleanest, of the largest size, and of high quality. For the greatest quantity of good fruit, clean cultivation, judiciously practised, is undoubtedly the best method to follow, but because of the more succulent growth of the tree under such conditions and consequent susceptibility and rapid spread of blight in the tree, less complete if not less *thorough* methods are necessary.

Various practices are followed in the bearing orchard.

(1) A sod mulch system. This consists of little or no cultivation, but instead the grass is allowed to grow. This is mowed and either raked and spread close in around the tree to act as a mulch to the tree and cause the sod to decay or is cut and allowed to lay where it falls to act somewhat as a mulch and retain some moisture. The mowing may be done two or three times a year. Any application of straw or strawy manure tends also to retain moisture and prevent the development of too stiff a sod. A fall application of straw or strawy manure around the tree trunks in addition to the mowing of the grass and weeds adds materially to growth and



Fig. 9. Sweet clover growing as a cover crop in orchard at Vineland in June, 1916.

vigor without producing growth in excess. In this case means must be taken to prevent girdling by mice or rabbits.

(2) Clean cultivation with a cover crop or clean cultivation in early spring leaving the weeds to grow from mid-July till fall is the practice most generally followed. This is undoubtedly the most ideal practice and is the one recommended if the ravages of blight are not serious.

(3) Leaving a strip of sod along the rows of trees and cultivating the centres. This system, where followed judiciously, seems to be giving good results. The sod close in around the trees seems to hold the growth in check, while the cultivated strip between the rows seems to be ample to supply enough plant food to keep the tree healthy and vigorous. From two-fifths to one-half of the total area is kept in sod.

The idea of the cultivated strip is apparently to produce a medium growth, healthy and vigorous, but not so rank that the susceptibility to blight is increased.

The objection to the sod mulch is the shelter it provides for insects and fungous diseases. Young trees present a different problem: the trees must be grown, and consequently it is advisable to produce as much growth as is consistent with blight resistance. Prune as little as possible. Some limbs or branches may be removed in order to balance the framework of the tree, but limbs should not be cut back unless absolutely necessary in order to form a suitable head. Grow intercrops; oats, if provision can be made for convenient cutting; potatoes, corn or any other hoed crop. A practice that is sometimes followed is to cultivate one year, seed to clover and timothy in July and cut for hay for one or two years; cultivation being practised only once in two or possibly three years.

The idea is to grow the trees as steadily and uniformly as possible. It is a very difficult task, and only with the most constant care can the best results be obtained.

A few young orchards have by choice of the owner been left in sod and the grass cut for hay. The practice is apparently to secure as little blight development



Fig. 10. An old orchard showing a strip of sod close by trees.

as possible, but growth is very slow, and what fruit is produced is small and knotty.

It would appear that with our present varieties there is no permanent relief from the ravages of Fire Blight, and that since blight resistant varieties are not available, the proper cultivation and treatment of the soil is the most important factor, if not the only practical means of saving many orchards, and developing new ones. It is claimed by many that constant cutting will control the blight, but in view of the fact that it cannot be all cleaned up in a neighborhood at once, being always present somewhere, if not in the orchard in the near vicinity, the cutting process must go on continually at the expense of the tree.

It is necessary for the grower to study his soil and to work out the proper balance between cultivation and sod, between manuring and intercropping, to suit

his conditions, and even then he may often make mistakes in abnormal seasons. As the situation stands at the present time, and with our present knowledge of the disease and methods of control, no definite advice can be given that will hold for most cases.

Cutting out is necessary to check the spread of the disease where it occurs, but it should be the constant aim of the grower to produce conditions unfavorable for the development and spread of this disease. Cutting out alone will not keep it under control.

PRUNING.

It is a safe rule to follow when it is stated that as little pruning as possible should be given. It is the natural habit of the tree to bear fruit, and this it will do even under adverse conditions. It is not the purpose of pruning to make a tree produce fruit, but to produce better, cleaner and larger fruit, and possibly also in greater quantity.

Pruning is very often, and especially with the amateur, practised in order to make the tree more attractive in appearance and more symmetrical and pleasing to the eye in general. In many cases, this practice is carried too far, and fruit-bearing is sacrificed to symmetry. Another reason why with the pear as little pruning as possible should be practised is because pruning (especially in winter) ordinarily induces more rapid succulent growth, which is likely to prove susceptible to blight.

Prune young trees as little as possible. Thin out any limbs that cross or interfere with the proper spacing of the branches that will at a later date form the framework of the tree. Cutting back or heading in is not considered advisable. This may be necessary in exceptional cases in order to properly form or balance a tree, but it should be done out of extreme necessity only. Taken in conjunction with cultivation and manuring, the aim should be to maintain a very steady uniform growth, at no time forcing to the extreme.

A bearing tree is less susceptible to blight, but even here it is considered advisable to reduce pruning to a minimum. A little pruning regularly, March and August, might be considered a reasonable rule. The habit of growth varies a great deal, and must to some extent be taken into consideration. The long, loose, open growth of such varieties as Bosc and Kieffer may be counteracted and brought within manageable bounds by a severe summer pruning about mid to late August after the trees have reached an age of five or six years.

FRUITING HABITS.

Pears, unlike the stone fruits, bear their fruit from terminal buds on short spurs. These spurs are found on two-year-old and older wood, and sometimes, but very seldom, fruit buds may be found terminating the growth of one-year-old wood. Such buds, however, as the latter seldom set fruit, and are of little importance to the fruiting habit of the tree. In a young and fast-growing tree, the spurs may become well developed on two-year-old wood, and as the tree increases in age continue to develop. They do not die out after one, two and three seasons of fruiting as in the case of plums.

Pruning, therefore, develops itself into a method of keeping these spurs in a healthy and vigorous state, with an ample supply of sunlight and air, to prevention of overbearing and the encouragement of some new growth. On the young trees the long one-year-old growth may be shortened back and thinned out, and so give the spurs full opportunity to develop. Too severe cutting, however, tends to produce wood growth at the expense of spur development. On an older and more mature tree, the annual growth becomes less rapid. The branches, which are from twelve to fourteen years of age, will bear a mass of fruit spurs. Each fruit bud will bear from four to five flowers and as many leaves, and the spur as long as it is maintained healthy and vigorous, will continue to produce fruit and leaves annually or biennially.



Fig. 11. Kleffer.



Fig. 12. Kleffer.

Fig. 11 shows a two-year-old branch of a young, fast-growing tree, with short fruit spurs up the stem. The twigs at the top are one year old. The illustration shows where the two-year-old branch has been shortened the previous year to encourage spur development. The branch, however, indicates extreme wood growth and indifferent spur growth, caused by too severe cutting back.



Fig. 13. Bartlett.



Fig. 14. Bartlett.



Fig. 15. Bartlett.



Fig. 16. Bartlett.

Fig. 12 shows the same type of branch in blossom. Notice that each spur has an ample supply of leaves to develop its fruit. This branch was much more "mature" for its age than Fig. 11. Notice also some terminal bloom on the new wood. This latter bloom by chance may develop fruit. Notice also that no blossoms are found on the new or one-year wood.

Fig. 13 shows the same type with its crop of fruit. Here it will be noticed that the development of each fruit seems to be in proportion to the amount of leaf surface growing on the spur.

Fig. 14 is an old and well-branched fruit spur found on the older branch of a tree. The exact history can be read owing to its habit of producing fruit from terminal buds. The bud that continues the growth of the spur arises from below the fruit during the year the fruit is being borne, and so causes the spur to have a zigzag appearance. A, B, C, and similar scars, show where the fruit has been borne. Each bud will ordinarily produce four or five blossoms and as many leaves, and at the time of opening will grow out an inch or more. These buds are not always fruit buds, as reference to Fig. 15 will show.

This is a similar spur and shows only two of these buds as being fruit buds. This condition on the individual spurs is largely controlled by the condition of the tree at the time these buds are being formed the previous year. Where there is an extra crop of fruit to call largely on the resources of the tree, nature has made provision that only a few fruit buds shall develop, and the remainder will be leaf buds. This creates a tendency towards the biennial habit of bearing.

Fig. 16 shows a spur similar to Figs. 14 and 15 in fruit. In this case, most of the leaves have been cut away and the buds may distinctly be seen. Notice the continuation of the spur in the long new wood at the left.

Figs. 17, 18 and 19 each shows a branch of a mature tree. It is obvious that such branches will need no pruning except for purposes of thinning the fruit. Here again each spur does not produce a cluster of blossoms. In some cases they may be seen to produce a small branch one or two inches long in the season; such a one, for instance, may be seen in Fig. 16, below the fruit at the left. The fruitfulness of each spur is controlled by conditions of the previous season, for if it could not then produce a fruit bud, none but leaves can arise the following season; in this season, however, it will make a very short growth of an inch or two and set good strong fruit buds.

Study figures 17 and 18 together. They are excellent illustrations of the general fruiting habit of the average mature but thrifty pear tree. Though the two illustrations are not from the same branch, Fig. 18 will illustrate where blossoms would have formed on Fig. 17.

SPRAYING.

Ordinarily pears should be given three sprayings the same as the apple, at about the same time, with the same materials and with the same degree of completeness and efficiency.

The first spray must be applied to the dormant wood. It is generally considered advisable to delay this as long as possible, or until the buds have begun to burst, if aphids have been present until the eggs have begun to hatch. Use the winter strength lime sulphur 1.03 specific gravity to each forty gallons of which have been added one-third pint of Black Leaf 40 or nicotine sulphate.

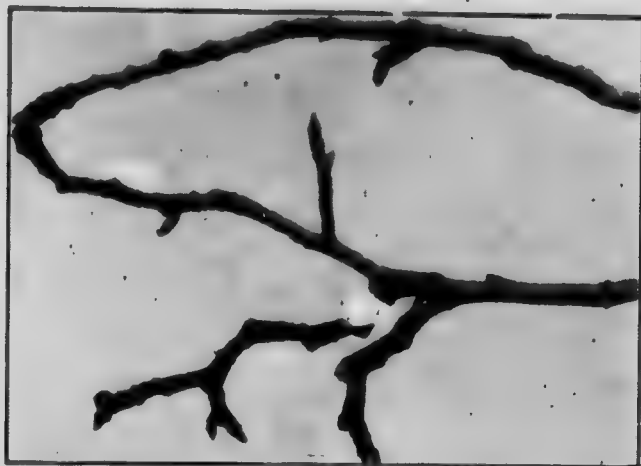


Fig. 19.



Fig. 18. Bartlett.



Fig. 17. Bartlett.

For the second spray use lime sulphur, summer strength, about 1.009 specific gravity, or slightly weaker, after the winter buds have burst and sent forth the blossom *unopened*, but before the petals have expanded. (The winter pear bud contains several blossoms which grow out to some length, each on a single petiole before the blossom opens). Add to this spray $2\frac{1}{2}$ lbs. of lead arsenate paste for each forty gallons of mixture. This spray is for both scab and worm control.

The third spray must be applied as soon as the petals of the blossoms have fallen, and before the calyces have closed. Use the same mixture, with the same addition of arsenate of lead as for the second spray. The lime-sulphur may, however, be made a little weaker, as low as 1.007 to 1.008 specific gravity.

A fourth spray, a duplicate of the third spray, may be used from ten to fourteen days later if considered advisable for the more complete control of worms and scab.

For special sprays for special outbreaks of any pest, see under the head of Insects and Diseases.

POLLINATION.

Each pear bud produces from five to eight blossoms. When bloom is heavy, or medium heavy, it is not necessary for more than one or two blossoms, usually, only one, to set fruit on each spur in order to produce a heavy crop of medium to large size fruit of good quality.

A few varieties of pears, including the Duchess of Angouleme and Boac, two of the leading varieties, are believed to be as nearly as can be judged from the small amount of work done on them, largely self-fertile. At the same time, more fruit is apparently set when intercrossed, or crossed with some other variety. It is a fairly safe rule to say that crosses are more likely to set and remain on the tree than fruit produced by self-fertilization, or pollen from another tree of the same variety.

Experiments also indicate that of the remaining best known varieties, including Anjou, Bartlett, Boussock, Clairgeau, Clapp, Lawrence and Winter Nelis, that self-sterility is the rule. Seckel and Kieffer are apparently partly self-fertile. Also in the face of experimental evidence that seems to point to the contrary, many large l'ocks of varieties, principally of Bartletts, set heavy crops of fruit fairly regularly. How much better they would do if interplanted with Anjou or Duchess can only be supposed or guessed, but it is reasonable to expect that the quantity would be materially increased.

Another factor that apparently must not be lost sight of in securing a heavy set of fruit is the general health and vigor of the tree. Experimental testing and observation both point to the fact that a vigorously growing tree sets a larger percentage of blossoms than the tree lacking in vitality.

Other points such as weather conditions and dates of blooming are also important factors in determining the set of fruit. These, however, need not be discussed here as the statements are general, and have been used very often in connection with other fruits.

One other point that might be emphasized is the value of the insects and the bees. Experiments again point to the fact that very often blossoms are pollinated by the wind, and that the major portion that are not automatically self-pollinated are pollinated by insects. The insects also distribute the blight infection, and

as such are more or less distrustful, but they are nevertheless essential to a full set of fruit in most varieties. The old places of infection, diseased limbs and branches, should be removed and destroyed before growth starts. The cankers on the trunks at the same time may be cut out, disinfected and painted over.

PROPAGATION.

The pear, like the apple, is propagated commercially by means of budding. Seedlings do not come true and are only grown for experimental purposes or for cross-breeding work. Nurserymen may obtain quantities of seeds from



Fig. 30.

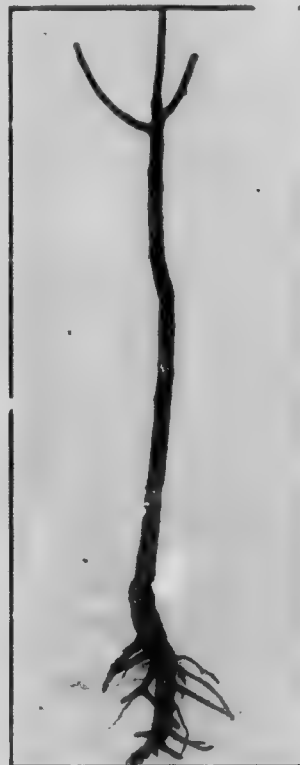


Fig. 21.

France. Usually this seed is saved from the refuse of perry (pear cider) presses, but only the best of these are used. Some nurserymen secure the young seedlings of one year's growth, and plant them directly into the nursery row. These usually come from France, preference being given them because the seeds from which they grew were started in beds and the small seedlings transplanted. This tends to the development of a branching root system, much more complete than ordinarily found in untransplanted stocks.

Some pear seed is gathered in Delaware, New Jersey, and Maryland, but what is considered by nurserymen to be seed of the best quality comes from

Japan. The American product is largely from Kieffer trees. Too much care can not be exercised in the selection of uniform vigorous seedlings for roots. In any case, the young seedlings are taken up in fall, stored over winter and are set in the nursery row early in the spring about six or eight inches apart. These are ready to bud by July and August, which process is accomplished in the same manner as with apples. After these trees have grown one year from the bud,



Fig. 22.



Fig. 23.

they are ready to set in the orchard if the grower prefers the one-year stock; if not, they are headed and allowed to grow for another season in the nursery row.

European stock is preferred rather than American stock owing to its greater vigor, uniformity and hardiness. It can also be obtained cheaply. Some varieties are budded on the Angers Quince stock for the purpose of dwarfing. The Duchess is the only variety grown extensively on this stock. The Bartlett, Anjou and Flemish Beauty also do well on quince, but are not long-lived as on the standard pear stock. Advantages claimed for the dwarf stock are earlier bearing, greater blight resistance, and a higher quality of fruit. This latter seems to be true of the Duchess.

The objection of the dwarf being short-lived may be overcome by planting the stock deeply and slitting the bark of the trunk. This will induce roots to

start from above the bud and the tree will tend to return to the standard type, as it gradually develops its own roots. Usually well grown, two-year trees are received from the nursery unless the one-year-old stock has been specified. These have been headed and the grower must accept the foundation work of the tree as delivered to him.

Fig. 20 shows the ordinary type of trees from the nursery. These require to be planted slightly deeper than in the nursery row, and also to have the head well short-ned back and shaped as in Fig. 21.

TOP-WORKING.

Top-working is not practised to any extent except for changing some undesirable varieties into more profitable ones, and also to aid in the control of blight.

Kieffer is usually used as stock in this case, and varieties that do well on Kieffer are Bartlett, Bosc, Clairgeau and Seckel. Fig. 22 shows Kieffer trees grafted to Bartlett in 1914, and Fig. 23 shows same trees bearing a fair crop of good Bartletts in 1916. The Kieffer may be used on dwarf stock as the medium for double working as in the case of Bosc and other varieties which do not unite readily with the Quince. Top-grafting should be done as early in the season as possible, before there is any movement of the sap, and is accomplished in the same manner as with apples.

HARVESTING.

The pear crop is usually picked and marketed immediately. Baskets, mostly eleven quarts, are used for the local markets, and boxes for the higher quality pears, which are sent to distant markets. Fig. 24 shows two boxes packed with Bartletts ready for shipment. Barrels are sometimes used for large quantities of winter pears, such as Kieffers.

Though most Ontario pears are shipped in baskets, and a few in barrels, too strong a plea cannot be made for a standard box. The lug box described below is undoubtedly a suitable package for a certain quantity of fruit, but the standard pear box of our competitors is much to be preferred. Properly packed, with the fruit properly graded and wrapped, both the consumer and producer stand in a fair way to being satisfied. The box contains a reasonable quantity, and unless very carelessly packed and handled reaches the market in good condition. The box most favored is 11½ in. wide, 8½ in. deep and 18 in. long, inside measurements. This is the same length and width as the standard peach and apple boxes recommended for the Pacific North-West. The variation is in depth only.

The lug box of the Pacific North-West is 14 in. x 16¾ in. x 5½ in., having a hand gouge on each end with a cleat 14 in. x 1½ in. x ½ in. under the cover, which permits a free circulation of air. It is used largely for shipping cherries also.

It cannot be said, however, that this box has a prominent place in Ontario.

The highest quality in pears is secured by picking just before ripe, and storing in a cool room until the color begins to change. If put on the market at this time they ordinarily command a much higher price than if handled green. Winter pears are improved by leaving on the trees as long as possible, and holding in storage for a certain length of time according to the variety.

MARKETS.

The demand for pears is very good at present, and if the supply is not greatly increased, it is reasonable to expect that prices will continue at a high level. The mere fact that large quantities of fresh pears are imported during the

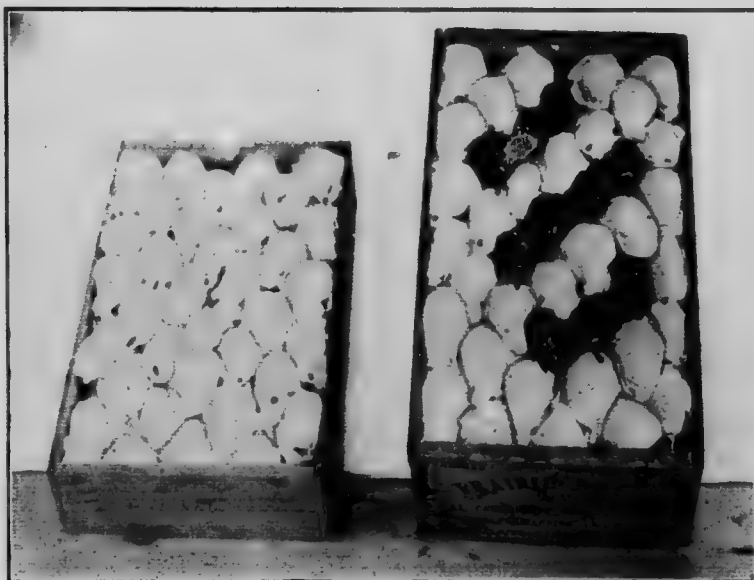


Fig. 24

pear season in spite of a high tariff is fairly indicative that prices to Ontario growers will be remunerative for years to come. This is more truly realized when it is considered the decrease in the number of bearing pear trees in the Province, and also that very few are being planted.

A ready outlet for pears is also found through the canning factories.

Many of our pears found a profitable market in England previous to the war, and this market will again be available as soon as shipping facilities are improved.

At present the local markets take practically all the pears grown in the Province.

A few figures on the cost of production and profit are always of interest, and will not be out of place here. These figures were compiled by a reliable grower, and are pretty close to the average, being taken from a mature orchard, and include cost of caring for one acre for one year only. No figures are available on the

cost of planting and rearing an orchard to bearing age, owing to the various methods of handling a young orchard.

The yields given below are averages over a number of years, and so are very near the actual conditions.

The price estimated at sixty cents per eleven quart basket to the grower is a fair average for the last three seasons, and includes the basket. This price is for the early pears (Clapps and Bartlett), and does not include the later varieties, nor the quantities sent to canning factories, which net a much lower price to the grower, usually less than two cents a pound.

No. of Trees	No. 11 qt. Baskets.	11 qt. Baskets per Tree.
225 Clapps	920	4.1
100 Boussock	520	5.2
700 Bartlett	1,874	3.1

Planted 20 ft. x 20 ft. give 109 trees per acre.

Average yield per tree 4.1 baskets, at .60....\$2.46.

2.46 x 109 trees....\$268.14. Returns per acre for one year.

COST OF CARING FOR ONE ACRE FOR ONE YEAR:

Interest on investment at \$400.00 per acre	\$24 00
Pruning	10 00
Spraying	11 00
Fertilizer	10 00
Plowing	5 00
Cultivating	4 00
Cover Crop	1 00
Picking and Selling	5 00
	<hr/>
	\$70 00

\$268.14—\$70.00....\$198.14 profit per acre for one year.

These figures are given for what they are worth as figures, and are intended merely as a guide to the prospective grower. With careful attention, the grower should easily get more than this for his net returns.

INSECTS.

The pear is attacked by most of the insects which attack the apple, and as there are many species, only the most important will be mentioned here. For a full account of these and also of the others, the reader should consult the bulletin on "Insects Attacking Fruit Trees," which is being prepared by Lawson Caesar, Provincial Entomologist, and will soon be ready for distribution.

SAN JOSÉ SCALE.

This is a very small but very destructive insect, and wherever it occurs must not be neglected, because otherwise in a few years it will destroy the whole orchard. It can easily be distinguished from the Oyster-Shell Scale,—a much less important insect,—by its shape, the San José Scale being circular and the Oyster-Shell Scale, as the name suggests, elongated and shaped somewhat like an oyster shell.

The best method of control is to spray the trees very thoroughly with lime-sulphur, strength 1.035 sp. gr., that is, 1 gal. of the commercial diluted with 7 gals. of water. Apply the spray just after the leaf buds have burst, but before

the blossoms have begun to open. One thorough application at this date will completely control the Scale no matter how bad it may be. The spraying could be done at other times of the year; for example, much earlier in the spring, or even late in the fall after the leaves are off, but by postponing the spraying until the time mentioned, it will control in most seasons the Pear Psylla.

THE CODLING MOTH.

The Codling Moth is the insect that causes wormy apples and pears. A large percentage of the fruit is often destroyed by it.

The best means of control is to spray the trees very soon after the blossoms have fallen, with lime-sulphur, strength 1.008 or 1.007 sp. gr., that is, 1 gal. of the commercial diluted with 35 or 40 gals. of water, and add to each 40 gals. of this 2 lbs. of arsenate of lead. Usually one thorough spraying so that the poison is driven into the calyx end of each young fruit will prove sufficient. On varieties not subject to Scab, the lime-sulphur may be omitted, and the arsenate of lead used with water alone.

THE PEAR PSYLLA.

This is a very tiny sucking insect, not more than one-tenth of an inch long, brownish or blackish in color, though the young insects are white or yellowish-white, and are usually found embedded in honey-dew. Both the adults and the young suck the juice out of the leaves, leaf stems and fruit stems, and cause a great weakening of the tree and stunting of the fruits. They also exude large quantities of honey dew, which gets everywhere over the tree, and as a black fungus grows in this, it discolors the fruit and leaves, giving them a sooty appearance.

The methods of control are first, as mentioned above under San José Scale, to postpone the first application of spray until the leaf buds have just burst. This destroys large numbers of eggs that are nearly ready to hatch, and also young nymphs that have already emerged. Second, orchards that are commonly much infested with this pest should receive additional treatment in the form of Black Leaf 40 or Nicotine sulphate 40 per cent., added to the regular Codling Moth spray mentioned above. The proportion of this tobacco extract to use is stated on the cans in which it is procured. Great care should be taken to see that all parts of the leaves and fruit are thoroughly covered. If this is done properly, all the young insects will be destroyed, and the trees will remain clean for the rest of the season or until the fruit is harvested.

PEAR OR CHERRY SLUG.

This is the little greenish-black, slimy larva, about half an inch long when full grown, which is often found feeding on the upper surface of the leaves of pears and cherries. It removes all the green of the upper surface, leaving the network of veins intact. The leaves, of course, become brown in consequence of the attack. Sometimes a large proportion of the foliage may be destroyed by this pest, of which there are two broods in the year.

It can easily be controlled. The proper way is to examine the orchard from time to time to see if the larvae are present in numbers sufficient to justify treatment, and if so, spray at once with 2 lbs. of arsenate of lead (paste) to 40

gals. of water, covering the leaves well with the spray. A second application later may occasionally be necessary. If only a few small trees are infested, dusting air-slaked lime in a fine dust over them will destroy most of the larvae.

DISEASES.

The diseases attacking pear trees will be found treated at considerable length in a bulletin entitled "Diseases Attacking Fruit Trees," which is being prepared by Professors J. E. Howitt and L. Caesar, and will be available soon after the publication of the present bulletin.

The chief diseases are as follows:

PEAR BLIGHT.

This is a bacterial disease and constitutes the greatest menace to pear growing. It is the disease which throughout the growing season causes the death of the leaves, also of the twigs and branches and often of the whole tree. It is carried from tree to tree by insects. The chief time for distribution is during the blossom season when bees and other insects that visit infected trees or portions of them, get their legs or beaks contaminated with the organism and fly from blossom to blossom, leaving the organism on everything they touch. A week or two after the blossoms fall, the leaves will be seen to turn brown on the infected twigs and die. This is evidence of the presence of the disease. Throughout the summer, sucking insects are the principal means of spreading this trouble. These by chance or otherwise puncture diseased twigs, fruits or leaves, or get contaminated with the organism by walking over places on the branches where the disease is causing an exudate of gum which contains many organisms; then they move to healthy twigs, especially water suckers, and by feeding on these cause them to become infected.

Control is not easy, in fact, it requires the utmost care and promptness. It has been demonstrated, however, that the disease can be controlled. The method is to go through all the orchards during the months of February and March, or any time before the sap has begun to move freely. Prune out all diseased branches, cutting about six inches below where the bark is seen to be dead. If there is a diseased area at the crotch, or if it extends only a short distance around the base of a water sucker or other twig, the diseased bark may often be removed with a draw-knife, or even with a stout jack-knife. Special pains must be taken to see that it is removed to a sufficient extent, so that there are no signs of discoloration in what is left. The reddish-brown stains in the bark are indications of the presence of the disease. The object of cutting it out early like this is that the disease may not be carried by the saw or other tools, as it would be if the sap were moving at the time of treatment.

Just before the blossoms open, it is important to go around again and visit all the trees to see whether any diseased parts have been left, and to remove all suspicious cases, or treat further all cases that give evidence of not having been properly treated before. All prunings should, of course, be promptly removed and burned so that insects will not have access to them.

The great importance of this early pruning is to remove as much as possible of the organism from the orchard so that bees, ants, wasps and other insects may not have a chance of becoming infested with the organism, and of spreading it at blossoming time.

The next stage when the disease must be carefully watched is after the blossoms have fallen. Too much care cannot be taken at this time in detecting the first signs of the blossom twigs beginning to wilt, for if these are noticed early and removed at once, the disease can be prevented from running down the branches and doing much damage, as it certainly would if not thus treated.

The proper course to follow is to remove at once all these diseased twigs as quickly as they show up. Often this can best be done by breaking them off with the hand. In some cases, the saw or the hand pruner must be used. Where this is done, the cut and also the saw or other implement must be disinfected at once with corrosive sublimate, one part to 1,000 parts of water, that is, one tablet to one pint of water. The corrosive sublimate may be carried in a bottle in the top of which a piece of sponge is placed. By inverting the bottle, the sponge becomes wet, and the wound can be moistened and also the cutting implement. Failure to disinfect will mean that in many cases the new cuts will become infected from the saw or the pruning tool. Usually, if prompt work is done, and these twigs are at once moved and burned, it will not be difficult to keep the orchard free from this disease for the rest of the season, so that this time during these two or three weeks after the blooming period is by all means the most critical time of the entire season, and is the time that requires most attention and most energetic action on the part of the owner. However, the orchard should be examined at least once every two weeks throughout the season, and any dead or dying branches removed. They should be cut, in all cases, about a foot below where the bark is dead, because the disease often runs inside the bark for a considerable distance without any evidence on the outside. All cuts, of course, must be disinfected.

Caution.—Corrosive sublimate if taken internally is deadly poison.

Some one person on each fruit farm should make a special study of the appearance of this disease, so that his eye will be trained to detect it readily, and that he will feel himself responsible for its prevention.

Pear growers who are specially interested in this matter, should get in touch with the Provincial Entomologist or with Prof. J. E. Howitt, O.A.C., Guelph, who will, so far as time permits, give them individual instruction along this line.

PEAR SCAB.

This is the disease that causes the black spots, and sometimes the cracking on the fruit. Some varieties are specially subject to this disease, Flemish Beauty being the worst. Many varieties are never affected.

The disease is not easy to control on Flemish Beauty, but it can be controlled with four sprayings of lime sulphur; the first being the regular spray mentioned above for San José Scale; the second, the regular spray just before the blossoms burst, which would come very soon after the first one; the third, the regular Codling Moth spray just after the blossoms fall; and the fourth, about ten days after the third. In all but the first application, use 2 lbs. arsenate of lead (paste) to either 40 gallons of Bordeaux mixture or of lime-sulphur, strength 1.008 or 1.007 sp. gr., that is, 1 gal. commercial lime-sulphur diluted with 35 to 40 gallons of water. The last spray should not be stronger than 1 to 40, because the leaves at this date are more likely to be injured. Good results, of course, should only be looked for if the work is well done. A fine mist spray is better for this purpose than a coarse one.

